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Memo

DATE: *May 26, 2002*

TO: RHIC E-Coolers

FROM: *Ady Hershcovitch*

SUBJECT: **Minutes of the May 24, 2002 Meeting**

Present: Ilan Ben-Zvi, Ady Hershcovitch, Jorg Kewisch, William Mackay, Christoph Montag, Satoshi Ozaki, Stephen Peggs, Triveni Srinivasan-Rao, Dejan Trbojevic, Dong Wang, Wu-Tsung W. Weng, Vitaly Yakimenko, Qiang Zhao.

Topics discussed: Simulation & Calculations.

Simulation & Calculations: Dong continued his report on the status of simulations and calculations performed with SIMCOOL. Computations now include different beam parameters (to be compared to those listed in Minutes of the April 19, 2002 Meeting). Tabulated below are the new beam parameters that are being considered. Most notable changes are the electron charge per bunch of 10 nC in the electron beam, a solenoid magnetic field error of 8×10^{-6}, and a transverse electron temperature of 330 eV. The idea is to "push" parameters that are reasonable achievable, which will lower the cooling time to an hour or less.

Choice of parameters is based on scaling that Dong showed of cooling rates with changes in solenoid magnetic field error and electron beam current. Cooling time improves substantially with increase in beam current or with lowering of the solenoid magnetic field errors. Cooling time decreases roughly linearly with increase in electron beam current. With reduction in solenoid field error, cooling time seems to decrease more dramatically (square or cubic relation). Shown below are scaling of cooling time as a function of charge per electron bunch and solenoid magnetic field error.

Next, the issue of how accurate can the magnetic field be made or measured was brought up. According to Mike, that level of field is achievable. Solenoids can be built with an accuracy of $5 \times 10^{-4}$and corrections of 10^{-2} can be made. However, after a solenoid is moved further corrections must be made.

Finally, Jorg reported on his visit to Bates Lab (he was joined by Dejan and Vadim Pitsin) to discuss E-RHIC. The ring-ring approach was discussed. The issues of making a high quality proton beam and of maintaining electron beam polarization remain unresolved. Due to difficulties in cooling protons, the present white paper is almost completely invalid.

Viewgraphs presented by Dong (on 5/24/2002)

Ion beam

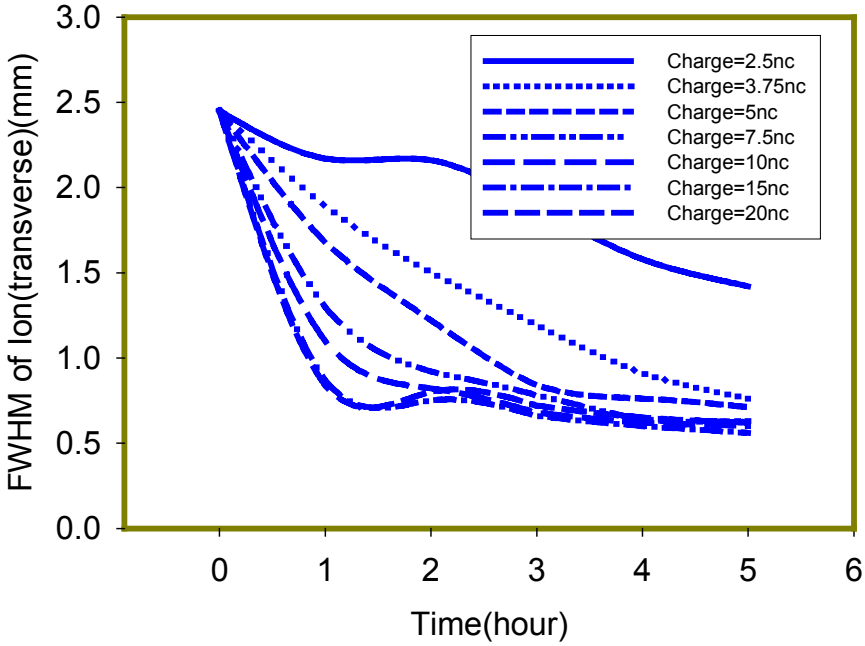
Energy	100	GeV/nucleon
No of bunches	120	
Bunch repetition rate	9.4	MHz
Particles per bunch	10^9	
Revolution frequency	78.2	kHz
Tunes	28.2/29.2	
Normalized emittance (95%) (start)	15	pi.mm.mrad
Bunch length	30	cm
Solenoid length	30	meter
Solenoid field	10000	Gauss
Beta-function at cooler	60	meter
Solenoid error level	$8x10^{-6}$	

Electron beam

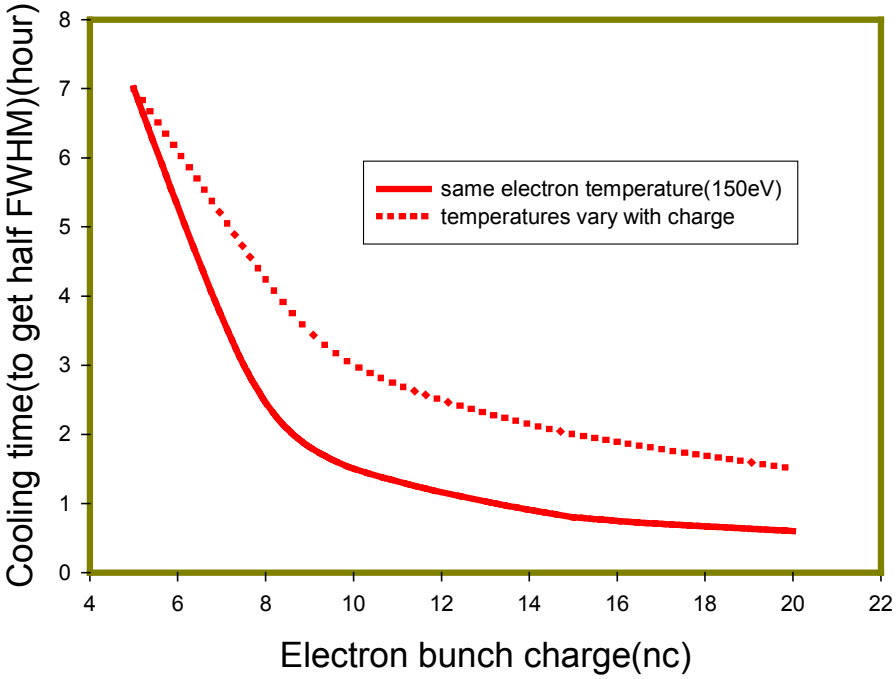
Energy	55	MeV
Particles per bunch	$6\ x10^{10}$	
Charge per bunch	10	nc
Ratio of cooler/circumference	0.0078	
Average current	94	mA
Beta function at cooler	~5	meter
Transverse temperature	330	eV
Energy spread	10^{-4}	
Bunch length	30	cm

Cooling vs. e- bunch charge

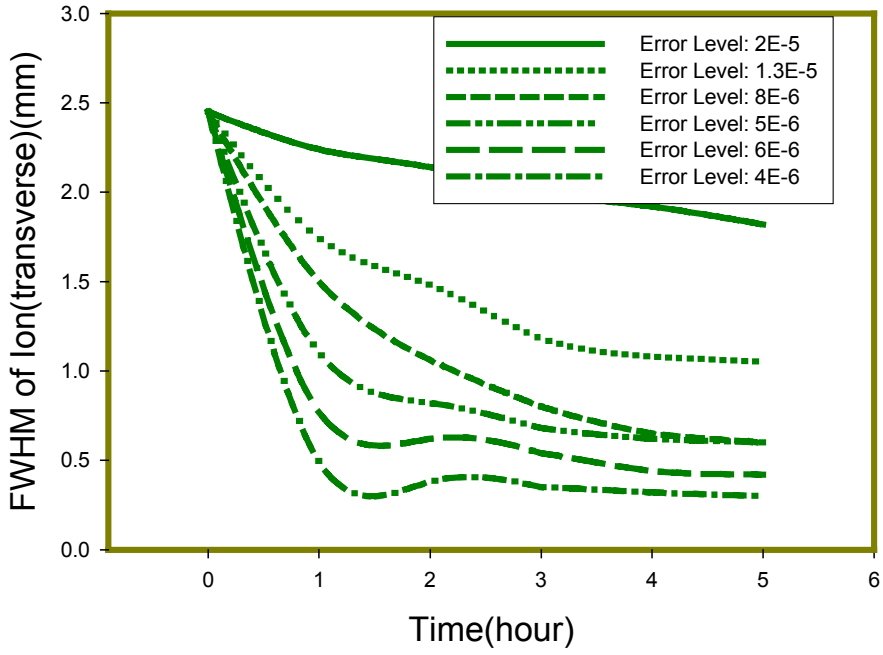
(Solenoid error level=8E-6)



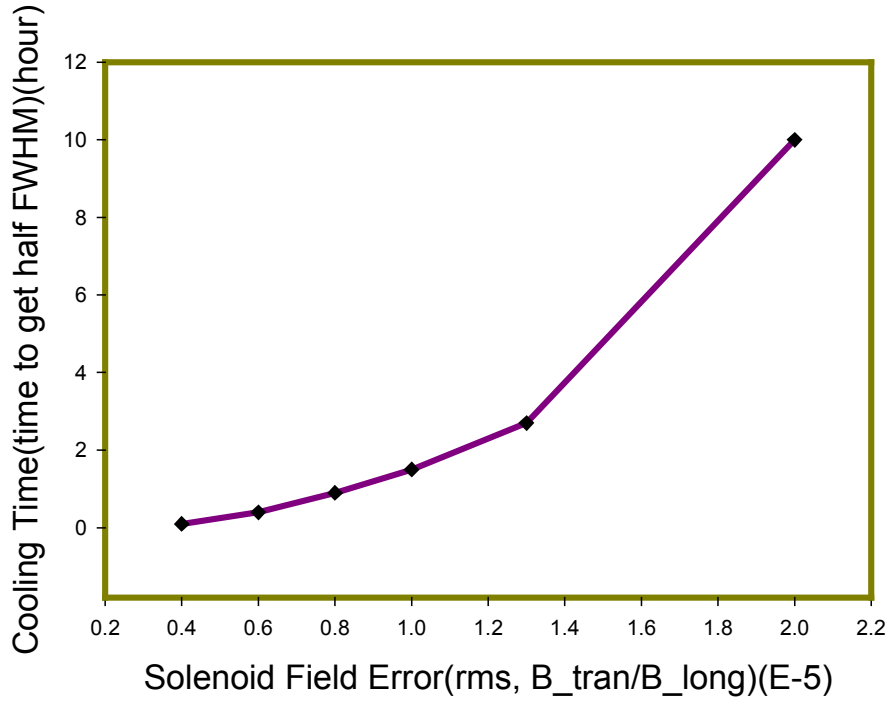
Cooling Time vs. e- bunch charge



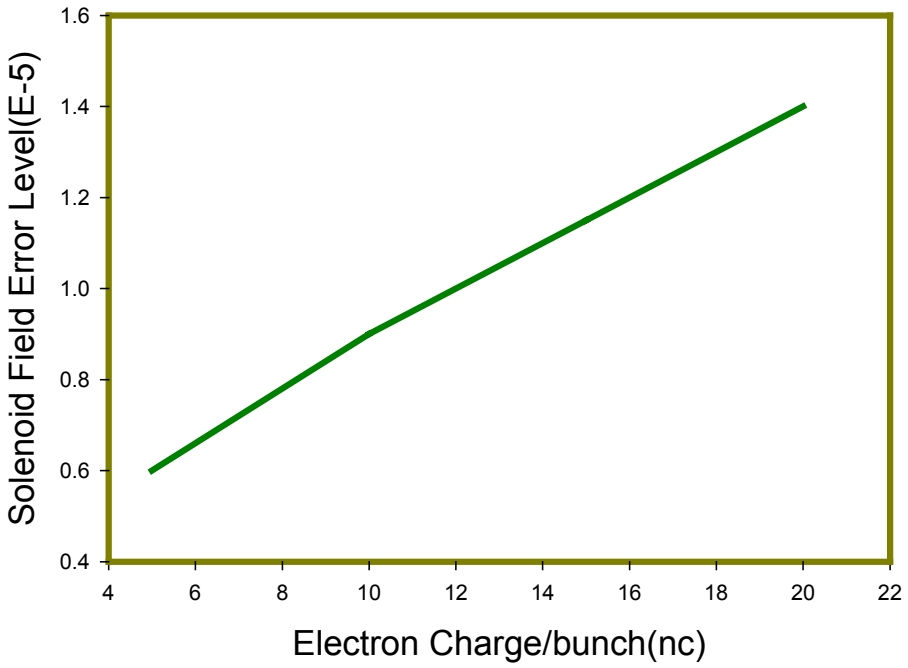
Cooling vs. different solenoid field errors



Cooling Time vs. Solenoid Field Error Level



To get 1 hour cooling time
Solenoid field error vs. e- charge/bunch



Comparison, field error vs. e- charge